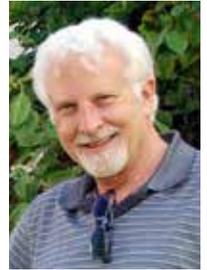


Tile and stone lippage: *Achieving acceptable tile lippage through quality tile and stone installations*



By Donato Pompo, CTC, CSI, CDT, MBA

Tile lippage is the vertical displacement between two adjacent tiles of a ceramic, glass, or stone tile installation. Excessive lippage can lead to a number of problems: the edge of the tile with excessive lippage can have a propensity to chip; furniture and appliances can get caught on edges and not slide easily across the floor; and most important today is that excessive tile lippage can be a safety hazard particularly to the elderly with our aging population. Tile lippage is an inherent characteristic of installed tile. It is not possible to eliminate it completely, but it can be minimized within reason.

(Ed. note: This is part two of a two part article. Part one appeared in the February issue of TileLetter, as the the Tech Talk feature.)

Installation methods – The tile installation method used can help limit tile lippage, or it can contribute to excessive tile lippage. Adhering the tile directly to the substrate, particularly if it hasn't been properly prepared to meet the industry requirements for flatness, can make it difficult to avoid tile lippage. On the other hand, installing tile in a fresh dry-pack

mortar bed while it is still in a plastic stage can help compensate for the tile dimensional variations because the installer can embed the tile into the fresh mortar.



This looks like excessive lippage due to type of lighting and viewing angle, but it isn't.



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Installer skill and workmanship
 – Another factor that can contribute to excessive tile lippage is the lack of skill and workmanship by the tile installer. It is very important how skilled and conscientious the tile installer is, and the lack of those qualities can be a contributing factor to excessive tile lippage. If the installer isn't experienced and skilled enough, or isn't detail minded, then poor workmanship can cause or contribute to excessive tile lippage. It is important that qualified skilled tile installers who understand – and are current with – industry standards are used for tile and stone installations to help ensure a successful installation.



This is measuring lippage from previous photo, which shows that the ceramic tile lippage is less than 1.6 mm (1/16") which is within standards.

Unavoidable lippage at drains – There are some applications where tile lippage to some degree is unavoidable. ANSI A108.02-2013-4.3.7 cautions that the lippage

requirements don't apply to tiled floors sloping to drains specifically when using tiles that are 6" x 6" (15 mm x 15 mm) and larger. The larger the tile surface area the greater the potential for tile lippage under these conditions. That is why you will often see tiles cut in half on a diagonal near drains that have sudden changes in slope. That doesn't mean the installer can have extreme tile lippage; it still needs to be reasonable considering the conditions. Using the relatively-new trench or linear drains can be good solution to avoiding this problem.

Perceived excessive tile lippage

– Another tile lippage problem is perceived excessive tile lippage,

when in fact lippage is reasonable and within allowable standard tolerances. The culprit is lighting. Even the best of tile installations can have perceived excessive tile lippage when the light is shining on the tile surface at a certain angle relative to the viewing angle. This is more problematic with large rectangular tiles with narrow grout joints installed on walls, particularly if the tile is installed in a staggered pattern. Just look at some tile exterior veneers when the sun is directly shining on the tile surface and you will find certain angles where it looks like there is so much lippage that you can climb up the wall, when in fact it is within tolerance. On the other hand, under

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other viewing angles or lighting conditions you don't see excessive tile lippage in these same installations.

Optical illusion caused by lighting – Sometimes lighting causes shadowing at the grout joint, creating an optical illusion that there is excessive tile lippage. This can occur in interior and exterior applications with natural lighting or with artificial lighting. The *TCNA Handbook* warns that the use of wall-washer and cove-type lighting – where the lights are located either at the wall/ceiling interface, or mounted directly on the wall – may produce shadows and undesirable effects with tiles. Similar shadows are created from natural lighting on interior walls and floors when light shines from an angle through windows and doors. I have investigated a number of projects, both commercially and residentially, where there were complaints of alleged excessive tile lippage only to find out during our inspection that it was reasonable and within allowable industry tolerances. On the other hand, I have seen cases where there was indeed excessive lippage when the above referenced contributing factors were not properly managed.

How tile installers can avoid actual or perceived excessive lippage – It is the same old answer: follow industry standards, and

don't accept substrates that don't meet industry standards, unless you are being paid to fix them.

It does not matter who is at fault when there is a problem – everyone ends up paying, either in time to defend themselves, money to fix the issue, or with their reputation. It is in everyone's best interest to ensure tile installations are compliant to industry standards. The following paragraphs summarize the key steps that should be followed for tile and stone installations to avoid excessive tile lippage.

1. Require a mock-up to be built that will become the standard upon approval for installation methods and for workmanship for aesthetic quality. It should include the specified lighting that the tile will be subjected to. If the client doesn't allow for a mock-up, then after the first portion of



The perception of lippage is affected by the angle of the light falling upon the wall.

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- the tile installation is completed, require that the client approve it and agree to use it as the standard for balance of the installation. This will help eliminate false expectations by the client, and if corrections are needed, it will be a lot less costly to fix it.
2. Use good quality installation products because they typically perform better.
3. Make sure your tile installers, both setters and helpers, are current with industry standards. They should be certified or verified to demonstrate they know and are current with industry thin-set standards (e.g. Certified Ceramic Tile Installers [CTI] through the Ceramic Tile Education Foundation [CTEF]; Tile Installer Thin-set Standards [ITS] Verification through the University of Ceramic Tile and Stone [UofCTS]).
4. The stone should meet ASTM standards for its respective geological classification. Ceramic tile should meet ANSI A137.1 standards, and glass tile should meet ANSI A137.2 standards. Be sure to closely inspect the tile before installing it. If the warpage or sizing appears to be excessive either refuse to install it or get a written letter from the client approving the consequences. Then install a mock-up and get the client's approval before proceeding.
5. Considering the tile's sizing and warpage tolerances, and the tile

- size and installation pattern, recommend a reasonable grout joint width to your client.
6. Be sure to inform your client that lighting can cause the perception that there are excessive irregularities in the tile installation, when in fact the installation is consistent with industry tolerances. Tell them that light fixtures must be placed in a manner to avoid direct lighting on tile wall surfaces. You don't need to tell them how to do it, as that is not your expertise. You can give them the language from our standards that warns of the problems that can occur if the lighting isn't placed properly.
 7. Evaluate the substrate to make sure it meets ANSI requirements for flatness. If it doesn't meet the ANSI standards then reject it and don't proceed until it is corrected. Or you can correct the substrate for an additional fee. Cementitious self-leveling mortars or patching mortars can work well for repairing or preparing substrates for your tile installation. ANSI A108.02 states that if there are any obvious defects or conditions preventing a satisfactory tile installation, the installer is to notify the architect, general contractor, or other designated authority in writing, and is not to proceed until satisfactory conditions are provided that will allow for an acceptable installation.
 8. Use the *TCNA Handbook for*

Ceramic, Glass, and Stone Tile Installation, the *Marble Institute of America Dimension Design Manual*, and the ANSI A108 standards as tools to persuade your clients of the need for you to follow the standards to ensure an acceptable tile installation. Being knowledgeable of these important standards will give you more credibility with your clients and will help you avoid costly problems.

9. If the architect's specification is ambiguous or if there is something wrong or missing, always submit an RFI (request for information) for clarification before proceeding with the work.

Conclusion

Excessive tile lippage can lead to damaged tile edges as various objects sliding on the floor hit these unsupported tile edges. Excessive tile lippage can cause trip and fall incidents, particularly for those elderly who tend to shuffle when they walk and use walkers. Even in commercial settings, tile lippage can be problematic and annoying as carts and other equipment clack as they run over tile edges.

Excessive tile lippage, or perceived excessive tile lippage, can be avoided by following the industry standards. Excessive tile lippage is typically due to a combination of improperly prepared substrates, improper installation methods, improper use of materials, and poor installer workmanship per-

formance. Perceived excessive tile lippage is typically due to improper lighting design, overly narrow grout joints, and not following industry recommendations. Avoid the false expectations by the specifier or client by informing them of the potential issue in advance.

To avoid these problems, installers must be current with industry standards and follow those standards and the product manufacturers' directions while installing the tile. Installers are mechanics with the skill level to provide quality workmanship, but they should not be expected to make architectural decisions – architects must give the installers the information and details they need to do their job correctly.

Many installers learn their skill on the job and do not have the opportunity to learn the industry standards. So it should be required that the tile installers are up to date with the current industry standards.

I have never investigated a tile or stone failure and found that all

the industry standards and manufacturers' instructions were followed. It is always the opposite. The failure is never due to one deficiency, but is generally due to many compounding deficiencies. Simply put, the key to a successful tile and stone installation is to follow industry standards.

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Viewing angle affects perception of lippage. Better lighting reduces the perception of lippage in this image – even though it's the exact same wall with acceptable – but unsightly – lippage earlier in the story.